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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/387,164	08/31/1999	YONGJUN HU	303.607US1	2253

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EXAMINER
ROY, SIKHA

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 05/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/387,164	HU, YONGJUN	
	Examiner	Art Unit	
	Sikha Roy	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 February 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

The Amendment (Paper # 6), filed on February 12, 2002 has been entered and is acknowledged by the Examiner.

Cancellation of claims 37-85 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5,7,9,11,13 -26,33 - 35 are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent 5,372,973 to Doan et al.

Doan et al. disclose (column 3 lines 5-55 Fig.1) a field emission display device having silicon layer serving as substrate onto which is deposited doped polycrystalline silicon and the conical micro-cathode with the emitter tip 13. On the P-type silicon wafer is formed N-type conductivity regions or wells. The wells having been implanted with ions are the site of the emitter tips. The ion implantation is done by oxidation process, the oxidation phase being conducted sufficiently long to produce sideways growth of the resulting oxide layer and thus forming emitter tips (column 4 lines 5-10) with ion implanted oxide layer. The emitter tip is oxidized to produce an oxide layer of SiO_2 (column 4 llines19,20). The sharpness of the emitter tips along with fine gate to tip

spacing in these micro cathodes result in emission of electrons at lower threshold voltages.

The limitations reciting the implanted layer inhibiting outgassing including moisture, lowering the potential barrier, affecting the image force and enhancing the Schottky effect so as to enhance the release of electrons being functional, no patentable weight is given.

Referring to claims 14, 16, 18, 20, 22 –26 Doans et al. disclose the SiO_2 layer being embedded (implanted) in the surface of the emitter.

Referring to claims 27-32 Doan et al. disclose (column 6 lines 34-40) the cathode tip 13 may be coated with low work-function material using various processes. The coating results in an emitter tip that may not only be sharper than a plain silicon tip but also has a greater resistance to erosion and a lower work function.

Referring to claims 33-35, Doans et al. disclose (column 3 lines18,19 Fig.1) field emission device comprising substrate 11, conical micro-cathode 13 with implanted oxide layer, the tip being additionally coated with a low work function material releasing stream of electrons17 emitted toward a phosphor coated screen 16.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4, 6, 8, 10, 12 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,372,973 to Doan et al.

Doans et al. do not disclose the oxide layer underneath the surface of the emitter. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the oxide layer formed underneath the surface, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

Referring to claim 36, Doan et al. disclose (column 1 lines 27-32) the use of a matrix-addressable array of cold cathode emission devices to excite phosphor on a screen of a flat panel display. Doan et al. further teach that narrow cathode-to-gate spacing and sharp tips with low work function material coating yield greater current with lowered threshold voltage. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the use of these field emission devices with a display screen in a video display for high brightness and uniformity of illuminated pixels.

Claims 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,372,973 to Doan et al. and further in view of U. S. Patent 5,817,201 to Greschner et al.

Greschner et al. in analogous art of fabricating a field emission device disclose (column 3 lines50-66, Fig.2) the tip comprising a body 9 of a first material forming the series resistor and a coating 7 of a second material with low work function allowing high

emission efficiency at relatively low voltages. The tip body 9 can be made of a dielectric material which is covered with a resistive layer. The tip-individual series resistor offers higher tip to tip homogeneity of electron emission since there is no voltage drop within a group of tips which provides the advantage of low supply voltage (column 3 lines37-41). It is further noted (column 4 lines 5-15) that the use of silicon for the high resistivity material is advantageous because the resistivity of silicon can be easily modified and silicon can be deposited by using standard depositing techniques.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to modify the embedded layer on the tip of low work function material of Doans et al. with a coating of resistive silicon as taught by Greschner et al. which provides the advantage of easy deposition and high field emission efficiency at lower voltages.

Response to Arguments

Applicant's arguments with respect to claims 1-3, 5,7,9,11,13-26,27-32 have been considered but are moot in view of the new ground(s) of rejection.

In response to applicant's argument that functional limitation must be evaluated and considered the examiner respectfully submits that the functional recitation (such as implantation layer limits outgassing) that has not been given patentable weight because it is narrative in form. In order to be given patentable weight, a functional recitation

must be expressed as a "means" for performing the specified function, as set forth in 35 USC 112 6th paragraph and must be supported by recitation in the claim of sufficient structure to warrant the presence of the functional language. *In re Fuller*, 1929 C. D. 172;388 O.G. 279.

In response to applicant's argument about the implanted or embedded oxide layer on the emitter, Lee et al. has also disclosed (column 2 lines 64-67, column 3 lines 1-3)a method of manufacturing field emitter comprising forming silicon oxide layer embedded on the upper part of silicon layer by means of oxidation resulting in cone-shaped field emitter tips.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited to further show the state of the art with respect to fabrication of electron field emitters.

U. S. Patent 5,201,992 to Marcus et al.

U. S. Patent 5,923,948 to Cathey, Jr.

U. S. Patent 6,165,808 to Zhang.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

S.R

Sikha Roy
Patent Examiner
Art Unit 2879

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